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Ethiopia's health extension workers use of work time on duty: time and motion study

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Abstract

Ethiopia implemented an innovative community-based health program, called the health extension program, to enhance access to basic health promotion, disease prevention and selected curative services by establishing health posts in every village, also called kebeles, with average of 5000 people, staffed with two health extension workers (HEWs). This time and motion study was done to estimate the amount of time that HEWs spend on various work duties and to explore differences in urban compared with rural settings and among regions. A total of 44 HEWs were observed for 21 consecutive days, and time and motion data were collected using tablet computers. On average, HEWs were on duty for 15.5 days out of the 21 days of observation period, and on average, they stayed on duty for about 6 hours per day. Out of the total observed work time, the percentages of total time spent on various activities were as follows: providing health education or services (12.8%); participating in meetings and giving trainings (9.3%); conducting community mapping and mobilization (0.8%); recordkeeping, reporting, managing family folders (13.2%); managing commodities and supplies (1.3%); receiving supervision (3.2%); receiving training (1.6%); travel between work activities (15.5%); waiting for clients in the health post (or health centre in urban settings) (24.9%); building relationships in the community (13.3%); and other activities that could not be meaningfully categorized (4%). The proportion of time spent on different activities and the total time worked varied significantly between rural and urban areas and among the regions (at $P < 0.05$). Findings of this study indicate that only a minority of HEW time is spent on providing health education and services, and substantial time is spent waiting for clients. The efficiency of the HEW model may be improved by creating more demand for services or by redesigning service delivery modalities.

Key words: Community health workers, demand, health extension worker, motion, time

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Key Messages

- Ethiopia s health extension workers (HEWs) are generally seen to have made an important contribution to Ethiopia s rapid health progress in rural areas.
- According to our study, health extension workers are spending relatively low percent of their time in direct health education and service provision.
- Relatively high share of HEW's time is spent waiting for patients and clients in health posts and in travel between work activities.
- We recommend that Ethiopia's Ministry of Health pay close attention to the evolving position of the HEW to assure productivity and quality of care as Ethiopia invests in the development of primary care.

Introduction

The Ethiopian government's Health Sector Transformation Plan (HSTP), to be implemented from July 2015 to June 2020, follows the completion of a 20-year National Health Sector Development Program (HSDP). During the HSDP period, the Government designed and implemented the country's flagship, community-based Health Extension Program (HEP) (FDRE MoH August 2015).

The HEP is a community-based strategy designed in 2002/2003 to expand access to basic health promotion, disease prevention and selected curative health services. Health extension workers (HEWs), who are females recruited from the community they serve, are deployed to service after a 1-year formal pre-service training provided after completing 10th grade of formal education (HEEC FMoH 2007; Workie and Ramana 2013; FDRE MoH 2015). Based on health posts that serve 5000 population, HEWs are responsible for delivering 16 health extension packages through home visits and outreach efforts (HEEC FMoH 2007; Workie and Ramana 2013; FDRE MoH 2015). The health extension packages focus on hygiene and sanitation, family health/maternal and child health/services, communicable disease prevention and control and health education and communication. To date, >42 000 HEWs are deployed throughout the country (HEEC FMoH 2007; Workie and Ramana 2013; FDRE MoH 2015), and they have contributed to improve the health of mothers and children among others (Karim *et al*. 2013). Given the extensive deployment of HEWs to support Ethiopia's primary care system, understanding how their time is spent will help to identify opportunities to improve their efficiency and impact.

Globally, the number of time and motion studies of community-based health workers, such as Ethiopia's HEWs, are limited. A 1995 study of the time allocation of health workers in rural health centres in Cameroon revealed 27% of health workers' time was spent on productive, health-related activities, and the majority of inactive time was spent waiting for patients (Bryant and Essomba 1995). In this study, productive, health-related time included performing administrative tasks, clinical work, promotion/prevention services and maintaining general hygiene in the health centre (Bryant and Essomba 1995). A 2014 study of community health workers in peri-urban settings in South Africa found even in very efficient, structured outreach, workers spent an average of 46% of their time in contact with patients and community members (Odendaal and Lewin 2014). The remainder of the time was spent walking, waiting, attempting to locate patients and completing reports (Odendaal and Lewin 2014).

Two recent studies conducted in Ethiopia, both of which were based on self-reported data from HEWs, explored how HEWs use their work time. One of these (Mangham-Jefferies *et al*. 2014) reported HEWs spent an average of 7 h and 49 min at work on each workday. While at work, HEWs recorded 4 h and 58 min/day on productive activities, which includes time recorded against any activity except breaks (Mangham-Jefferies *et al*. 2014). The other study (Miller *et al*. 2014) conducted with 201 HEWs found that HEWs spent an average of 6.1 h/day at work. On average, they spent 4 h providing services in the health post, 30 min providing services in the community and 1 h on community mobilization/awareness creation (Miller *et al*. 2014).

Although these data are helpful, Ethiopian studies have generally used self-reported data, which will have limitations, and samples have been confined to one or two regions or program area rather than reflecting the country's national diversity.

To improve on this existing evidence, we sought to estimate total time worked and allocations among various activities using a direct nonparticipant observation method with a diverse sample of HEWs from urban and rural areas across the different regions of Ethiopia.

Given the extensive deployment of HEWs to support Ethiopia's primary care system, understanding how their time is spent is a critical element of evaluating current contributions and identifying opportunities for redesigning aspects of the position to improve HEW satisfaction, preparation and effectiveness. HEWs scope of work is expanding from time-to-time, and the work burden is expected to increase as the package of basic curative and other clinical services offered at the health post level continues to expand. Understanding how they are managing their work is critically important for future policy decisions.

The present study was designed to improve on the previous literature in many ways. First, it sought to enhance the validity of the data by using direct observation and using more detailed data collection tools for extended 3-week time periods, rather than relying on self-reported diaries as done in the previous Ethiopian studies. Second, the data were collected for urban and rural sites within diverse regions, as well as for higher and lower performing areas within regions for a diverse sample.

Findings of this study can make an important contribution in informing policy makers to design and implement strategies that will strengthen Ethiopia's HEP.

Materials and methods

The time and motion study was conducted among 44 HEWs[1] (22 pairs) selected from 22 woredas.[2] Primary Health Care Unites (PHCUs) were selected to be diverse in region (Table 1) [Oromia, Tigray, Southern Nations Nationalities and Peoples (SNNP), Amhara and Addis Ababa City Administration], setting (urban/rural) and performance (higher/lower). Although the number of HEWs observed was small relative to the several thousand working in Ethiopia, their selection resulted from a rigorous sampling

Table 1. Sample of woredas

Region	Urban ($N = 6$)	Rural ($N = 16$)	Woredas
Addis Ababa	1 Higher and 1 lower performer	N/A̍	2
Oromia	1 Lower performer	2 Higher and 2 lower performers	5
SNNP	1 Higher performer	2 Higher and 2 lower performers	5
Tigray	1 Higher performer	2 Higher and 2 lower performers	5
Amhara	1 Lower performer	2 Higher and 2 lower performers	5
Total			22 Woredas

methodology such that the data pertaining to their time allocations can be reliably generalized to the sampling frames from which the 44 HEWs were selected. Figure 1 shows a summary of the sampling method.

Selection of woredas

Within each region (Oromia, SNNP, Tigray, Amhara and Addis Ababa), woredas were classified as urban or rural based on information obtained from the Ethiopian Central Statistics Agency (http://www.csa.gov.et). A total of seven sampling frames (i.e. lists of woredas) were created: (1) Addis Ababa woredas, (2) Oromia and SNNP urban woredas, (3) Tigray and Amhara urban woredas, (4) Oromia rural woredas, (5) SNNP rural woredas, (6) Tigray rural woredas and (7) Amhara rural woredas.

To diversify samples, within each sampling frame, woredas were ranked on their performance using the 2011/2012 Health Management Information System performance report (reported as baseline in the 2012/2013 annual woreda-based plan) (MoH 2013). For each woreda, a summary performance index (SPI) was calculated based on performance in five indicators: (1) antenatal care coverage rate (one visit), (2) skilled birth attendance rate, (3) infant complete immunization rate, (4) percentage of woreda with latrine and (5) percentage of families certified as 'model families' by implementing health extension packages.

Woredas were assigned a quartile rank (1, 2, 3 and 4) within their sampling frame, where a rank of 4 indicated the quartile of highest performance for each indicator, and a rank of 1 indicated the quartile of lowest performance for each indicator, compared with all woredas within the sampling frame. Then for each woreda, the quartile assignments were summed across the five indicators, so that each woreda was given an SPI, which ranged from 5 (lowest performance) to 20 (highest performance).

Woredas in the top 5% SPIs for their sampling frame were classified as higher performing woredas, and the woredas in the bottom 5% SPIs for their sampling frame were classified as lower performing woredas. The top and bottom 5% of woredas for each sampling frame were then randomized, and the top of each randomized list was the recommended woreda for selection in consultation with local health authorities, who were asked for any additional information on performance.

Selection of HEWs for observation

In rural woredas, within the selected higher or lower performing woredas, the highest or lowest performing health centre and the highest or lowest performing health post connected with the selected health centre were selected using a similar approach. Both HEWs at the selected higher performing health post were enrolled in the study.

In urban woredas, which do not have health posts, the woreda health officer identified the highest and lowest performing HEW based on criteria that include degree of mapping and perceived knowledge of the catchment population, perceived strength of relationships with the community and local administration, linkage with the health centre, perceived dependability (time spent at work; honesty), any receipt of recognition for performance, perceived success in training volunteers for Health Development Army, quality of work, organization of data and time at work. Once the highest or lowest performing HEWs were identified, both were recruited for the study.

The final sample of HEWs ($N = 44$) included 12 HEWs from urban areas and 32 HEWs from rural areas. Of the 44 HEWs, 22 were from higher performing woredas and the other 22 were from lower performing woredas.

The study proposal was reviewed and approved by the Human Subject Committee of Yale University. Information about the study was provided to study participants, and consent was obtained from them before their voluntary participation.

Data collection, quality assurance and analysis

HEWs were observed by a team of trained data collectors using a standardized data collection checklist digitalized into hand-held electronic tablet computer. Each HEW was followed up in person for 21 consecutive calendar days, including weekends, during April–June 2014. Each day when the HEW reported for work, the data collector recorded her activities continuously beginning with the HEW's first work-related task of the day after arriving at work and ending when the HEW completed the last work-related task of the day before leaving for home. In addition to the continuous recording of HEW activities, observers also entered end-of-day reflections to facilitate the interpretation of data. Data quality was ensured through (1) careful selection of data collectors and ensuring 5 days of data collectors training prior to deployment, (2) intensive field supervision by fulltime experts, (3) data review every 2–3 days to identify problems and take corrective measures in a timely manner and (4) data cleaning by experienced analysts to look for gaps and anomalies. After the completion of data collection, all data sets were combined into one, and completeness and accuracy of all variables were ensured before analysis.

HEWs' time was categorized into the following activities: providing health education or services (i.e. delivering the health extension service packages, usually in the health post or at the household level); participating in meetings and giving trainings (i.e. attending health and non-health development meetings, delivering HDA trainings); conducting community mapping and mobilization for upcoming activities; recordkeeping, reporting, managing family folders; managing commodities and supplies; receiving supervision; receiving training; travel between work activities; waiting in the health post (or health centre in urban settings); building relationships in the community and other activities that could not be meaningfully categorized. Breaks and meals were excluded from the analysis.

The categories that are listed as waiting in the health post and building relationships in the community represent times when the HEW was at work at the health post or in the community,
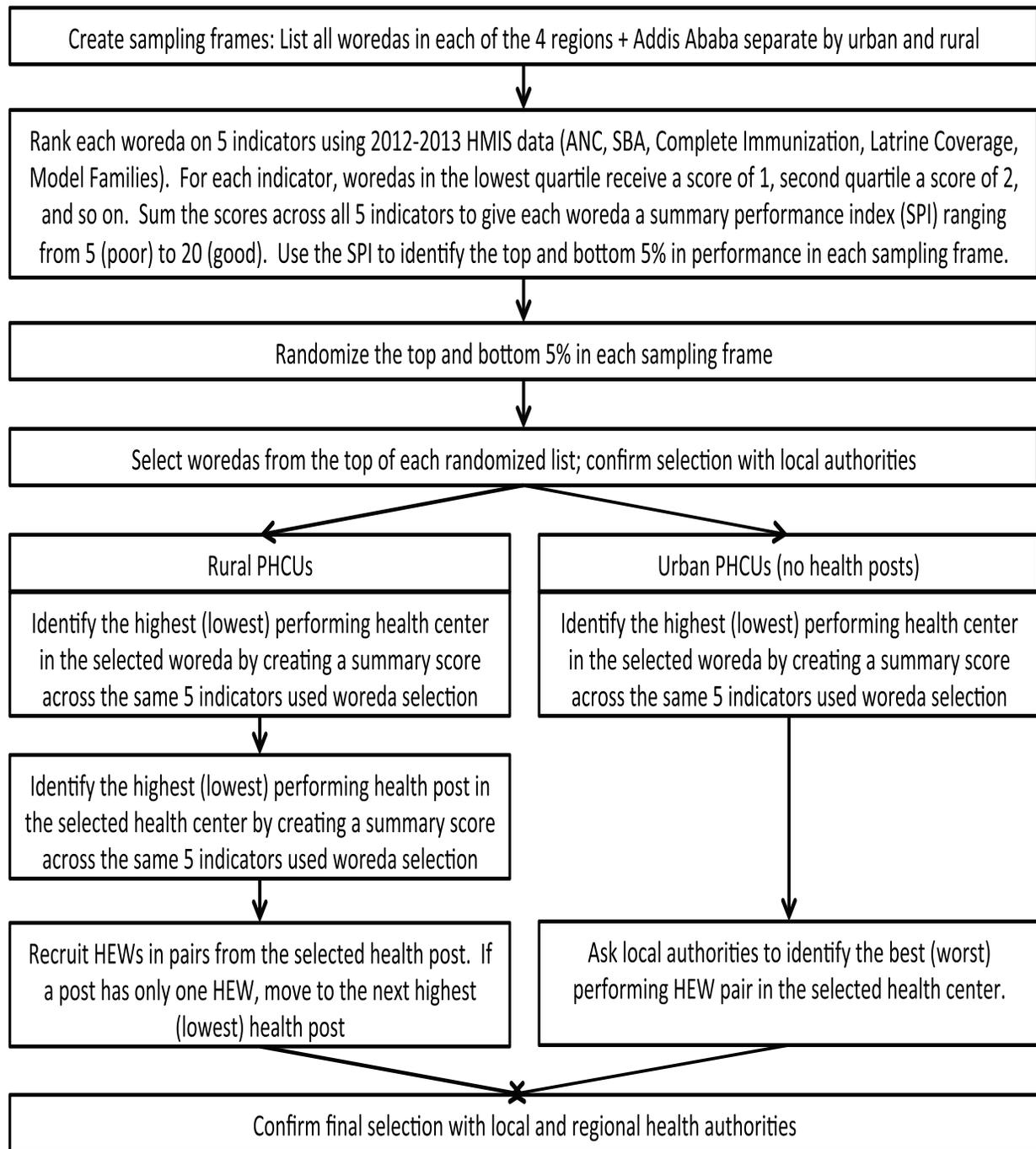
Figure 1. Summary of sampling method.

respectively, but was not completing a formal or structured activity that could be categorized as health-related activity by the observer. Based on debriefs with data collectors, these categories represent a wide range of experiences such as HEWs keeping the health post open for the expected time despite lack of service users, HEWs informally engaging opinion leaders in the community, or HEWs stopping to chat with friends and community members on the way to other activities in the community.

Although HEWs are government-employed civil servants, and civil servant working hours are Monday to Friday; from 8.30 am to 5.30 pm with 1-h lunch break except Friday, at which lunch break is 2 h, as the HEWs are based within the community they can to follow flexible working hours.

Data were analyzed using Excel and SAS v 9.3. Statistical comparisons were made using *t*-tests, chi-square analysis and analysis of variance as appropriate. *P*-values were calculated to test the hypothesis that there is no statistically significant difference among the regions or between rural and urban settings.

Results

Characteristics of study participants

The average age of the 44 HEWs was nearly 27 years (Table 2). Participants had, on average, 5.3 years of experience as HEW, including 3.8 years in their current health post at the time of data

Table 2. Descriptive characteristics of study participants ($N = 44$)

Variable	N (%)[a]
Age, M (SD) and range	26.7 (5.2) and 21–49
Education level	
Level 3	34 (77.3%)
Level 4	10 (22.7%)
Number of years as HEW, M (SD) and range	5.3(2.7) and 0-10
Number of years at current heal th post, M (SD) and range	3.8 (2.7) and 0 – 9
Monthly salary in birr, M (SD) and range	1399 (274) and 908 – 2151
HEW comes from	
Current kebele	15 (34.1%)
Other kebele in the same woreda	21 (47.7%)
Other kebele in another woreda	8 (18.2%)
Distance to health centre in km, M (SD) and range	8.4 (10.6) and 0 – 40
Distance to woreda health office in km, M (SD) and range	20.6 (31.4) and 0 – 135
Location type	
Urban	12 (27.3%)
Rural	32 (72.7%)
Public transportation available to kebele	
Yes	28 (63.6%)
No	16 (36.4%)

[a]Continuous variables are reported as mean (SD) and range, and categorical variables are reported as N (column %).

collection. The average monthly salary was about 1400 Birr (about $67 USD). The average distance to the nearest health centre from their health post was about 8 km, with a range of 0–40 km, and the average distance to the woreda health office was about 21 km. Rural HEWs comprise 73% of the sample.

Number of work days and observed time spent on various activities by HEWs

In the 21 days of observation period, HEWs worked for an average of 95 h and 50 min with significant variation across regions, from a mean of 121 h and 22 min in Tigray and a mean of 75 h and 39 min in SNNP region ($P = 0.019$).

HEWs on average worked for 15.5 days in the 21 observation days, with significant variation across regions, from 17.5 days in Tigray to 13.3 days in Addis Ababa ($P = 0.023$). The average non-working days including weekends during the same period was 5.5 days with significant variation across regions from 3.5 days in Tigray region to 7.7 days in Addis Ababa ($P = 0.023$) (Table 3).

The average number of hours HEWs worked in a workday is about 6 h, with statistically significant difference across regions ($P = 0.018$). HEWs in SNNP region worked for average of 4 h and 50 min in a workday, about 1 h less than the daily average across regions. In a 7-day period, HEWs worked on average for 31 h and 57 min, with significant difference between regions, from 40 h and 27 min in Tigray region to 25 h and 13 min in SNNP region ($P = 0.019$). On average, 4 h and 12 min of their observed work was completed on weekends ($P = 0.002$) (Table 3).

Proportion of HEW observed time spent on different activities

Out of the total observed work time in the 21 days, HEWs spent 12.8% of their time providing health education and services, 13.2% on recordkeeping, reporting and managing family folders, 9.3%

participating in meetings and giving trainings, 0.8% on community mapping and mobilization and 1.3% managing commodities and supplies. Proportion of time spent in receiving supervision and training was 3.2% and 1.6%, respectively. A little >15% of their time (15.5%) was spent traveling between work activities. Nearly 25% (24.9%) of the observed time was spent waiting for clients, 13.3% of the time was spent building relationships in the community and 4.0% of their time was spent on other activities that could not be meaningfully categorized (Table 4).

On average, HEWs spent 67.4 min per workday for travel between work activities. Those in urban areas spent an average of 47.5 min per workday, while those in rural areas spent 74.8 min per workday for travel between work activities. The average time spent between work activities per workday range from 0 to 175 min.

Statistically significant differences were observed across regions in the proportion of observed time spent in; providing health education and services ($P = 0.005$) with highest in Tigray region (17.3%) and lowest in Addis Ababa region (3.6%), participating in meeting and giving training ($P = 0.001$) with highest in Tigray region (18.3%) and lowest in Oromia region (3.6%), waiting for clients ($P < 0.001$) with highest in Amhara region (50.2%) and lowest in Addis Ababa region (6.0%), and building relationship in the community ($P < 0.001$) with highest in Addis Ababa region (52.7%) and lowest in Amhara region (5.2%) as presented in Table 4.

Statistically significant differences in the proportion of time spent in providing health education and services were observed in urban compared with rural areas (8.6% in urban versus 14.4% in rural; $P = 0.007$), managing commodities and supplies (0.4% in urban versus 1.6% in rural; $P = 0.004$), waiting for clients (5.2% in urban versus 3.6% in rural; $P = 0.024$) and building relationships in the community (21.3% in urban and 8.5% in rural; $P = 0.011$) as presented in Table 5.

As presented in Table 6, the mean total working days out of the total 21 observed days, mean hours per workday per HEW, mean total hours worked per 7-day period, and other related variables are not found to be significantly different between high-performing and low-performing PHCUs (Table 6).

Additionally, neither the percent of HEWs who spent at least 20% of their time providing health education and services nor the percent of HEWs who worked >8 h/day was significantly associated with being a higher versus lower performing PHCU.

With regard to place of service delivery, out of the total time spent in providing health education and services, 42.8% of this time was spent at the health posts, 36.5% of this time was spent in community households, 7.8% at schools or other outreach sites and 12.9% of this time did not have a recorded site (Table 7).

Out of the total time spent in providing health education and services, 44.7% of the time was spent to provide family health/ maternal and child health/service, 30.3% on hygiene and sanitation and 12.4% on disease prevention and control with focus on Malaria, Tuberculosis and HIV/AIDS (Table 7).

HEWs spent 75.3% of the total time spent in providing health education providing prevention and health promotion services while they spent 12.8% of this time providing curative services; for 11.9% of this time, the type of activity was not specified.

Out of the total time spent in providing health education and services, the majority (44.7%) was spent for providing maternal and child health/family health/services followed by hygiene and sanitation (30.3%), and communicable disease prevention and control (12.4%), and the rest was not specified (11.9%). HEWs in rural areas spent significantly more time on maternal and child health/ family health/services ($P = 0.015$) and communicable disease

Table 3. Number of days and amount of HEW time observed by region (*N* = 44)

	All HEWs N = 44	Amhara N = 10	Tigray N = 10	SNNP N = 10	Oromia N = 10	Addis Ababa N = 4	P-value[a]
Mean total working days per HEW, out of 21 observation days	15.5	16.2	17.5	15.0	14.4	13.3	0.023
Mean nonworking days (weekend, holidays and sick) per HEW, out of 21 observation days	5.5	4.8	3.5	6.0	6.6	7.7	0.023
Mean hours per workday per HEW (start of workday to end of workday, not including break/meals) [h:min]	6:01	6:15	6:49	4:55	5:50	6:43	0.018
Mean total hours worked per 7-day period (not including break/meals) [h:min]	31:57	34:26	40:27	25:13	28:34	29:42	0.019
Mean weekday hours worked per 7-day period (not including break/meals) [h:min]	27:45	29:28	32:07	22:47	25:55	29:29	0.093
Mean weekend hours worked per 7-day period (not including break/meals) [h:min]	4:12	4:58	8:21	2:26	2:38	0:13	0.002
Total observed time (not including breaks/meals) [h:min]	95:50	103:17	121:22	75:39	85:41	89:07	0.019

[a]*P* values are derived from ANOVAs, using the null hypothesis of no significant differences across regions.

Table 4 Percentage of HEWs observed time spent on different activities by region (*N* = 44)

	All HEWs N = 44% (SD)	Amhara N = 10% (SD)	Tigray N = 10% (SD)	SNNPR N = 10% (SD)	Oromia N = 10% (SD)	Addis Ababa N = 4% (SD)	P-value[a]
Providing health education or services[b]	12.8 (6.5)	11.2 (8.7)	17.3 (4.0)	12.9 (4.8)	13.6 (5.1)	3.6 (1.7)	0.005
Participating in meetings and giving trainings	9.3 (7.6)	7.4 (4.9)	18.3 (6.0)	9.7 (7.4)	3.6 (3.8)	5.2 (4.0)	<0.001
Community mapping and mobilization	0.8 (1.7)	0.5 (1.0)	1.4 (2.1)	1.3 (2.8)	0.3 (0.5)	0.3 (0.4)	0.484
Recordkeeping, reporting, managing family folders	13.2 (8.4)	10.3 (9.8)	11.7 (8.8)	17.2 (6.2)	14.0 (7.1)	11.9 (11.1)	0.414
Managing commodities and supplies	1.3 (1.9)	0.6 (0.6)	1.4 (2.5)	1.7 (1.8)	2.0 (2.3)	0.2 (0.3)	0.325
Receiving supervision	3.2 (4.3)	1.1 (1.6)	3.0 (2.4)	2.2 (2.3)	6.7 (7.3)	2.3 (1.6)	0.032
Receiving training	1.6 (3.6)	0.3 (0.9)	0.4 (0.9)	1.4 (3.2)	2.7 (5.8)	5.4 (4.5)	0.091
Travel between work activities	15.5 (8.5)	10.9 (6.8)	16.9 (7.5)	15.8 (6.5)	20.6 (11.0)	10.3 (5.8)	0.068
Other activity	4.0 (4.6)	2.3 (3.6)	3.2 (4.7)	4.1 (1.8)	7.1 (6.8)	2.1 (1.6)	0.137
Waiting for clients in the health post (health centre in urban settings)	24.9 (21.4)	50.2 (23.7)	9.5 (8.7)	24.8 (15.0)	22.7 (13.0)	6.0 (7.1)	<0.001
Building relationships in the community	13.3 (15.5)	5.2 (4.4)	17.0 (10.5)	8.9 (9.6)	6.5 (4.9)	52.7 (13.4)	<0.001
Total percent observed	100	100	100	100	100	100	

[a]*P*-values are derived using the null hypothesis of no significant differences across regions.
[b]The category of 'providing health education and services' is narrowly defined as the direct education and care provided in delivering the health extension service packages, usually in the health post or at the household level or at health centre level in the urban context.

Table 5. Percentage of HEWs observed time spent on different activities by urban and rural setting (*N* = 44)

	All HEWs N = 44% (SD)	Urban N = 12% (SD)	Rural N = 32% (SD)	P-value[a]
Providing health education or services[b]	12.8 (6.5)	8.6 (5.5)	14.4 (6.2)	0.007
Participating in meetings and giving trainings	9.3 (7.6)	10.1 (8.3)	9.0 (7.4)	0.681
Community mapping and mobilization	0.8 (1.7)	1.1 (1.9)	0.7 (1.7)	0.565
Recordkeeping, reporting, managing family folders	13.2 (8.4)	13.6 (9.7)	13.0 (8.0)	0.831
Managing commodities and supplies	1.3 (1.9)	0.4 (0.7)	1.6 (2.1)	0.004
Receiving supervision	3.2 (4.3)	3.7 (4.6)	3.0 (4.2)	0.630
Receiving training	1.6 (3.6)	2.6 (4.2)	1.2 (3.4)	0.305
Travel between work activities	15.5 (8.5)	14.4 (6.5)	16.0 (9.2)	0.594
Waiting for clients in the health post (health centre in urban settings)	24.9 (21.4)	13.2 (12.6)	29.3 (22.5)	0.024
Building relationships in the community	13.3 (15.5)	27.2 (21.3)	8.2 (8.5)	0.011
Other activity	4.0 (4.6)	5.2 (5.2)	3.6 (4.4)	0.302
Total percent observed	100	100	100	––

[a]*P*-values are derived from t-tests using the null hypothesis of no significant differences between urban and rural settings.
[b]The category of 'providing health education and services' is narrowly defined as the direct education and care provided in delivering the 16 HEW service packages, usually in the health post or at the household level.

Table 6. Average number of days and amount of HEW time observed in lower and higher performing woredas ($N = 44$)

	All HEWs N = 44	Lower N = 22	Higher N = 22	P-value[a]
Mean total working days per HEW, out of 21	15.5	15.6	15.5	0.829
Mean nonworking days (weekend, holidays and sick) per HEW, out of 21	5.5	5.4	5.5	0.829
Mean hours per workday per HEW (start of workday to end of workday, not including break/meals) [h:min]	6:01	6:15	5:48	0.300
Mean total hours worked per 7-day period (not including break/meals) [h:min]	31:57	33:00	30:53	0.538
Mean weekday hours worked per 7-day period (not including break/meals) [h:min]	27:45	28:57	26:32	0.330
Mean weekend hours worked per 7-day period (not including break/meals) [h:min]	4:12	4:03	4:21	0.821
Average total observed time per HEW (not including breaks/meals)	95:50	98:59	92:40	0.538

[a]P-values derived from t-tests using the null hypothesis of no significant differences between HEWs from lower and higher performing sites.

Table 7. Time spent providing health education or services by location, service package, and preventive/curative split; overall and by region ($N = 44$)

	All HEWs N = 44 %(SD)	Amhara N = 10 %(SD)	Tigray N = 10 %(SD)	SNNPR N = 10 %(SD)	Oromia N = 10 %(SD)	Addis Ababa N = 4 %(SD)	P-value[a]
By location							
Health post	42.8 (23.2)	36.6 (27.3)	40.6 (25.2)	55.6 (19.7)	46.7 (22.1)	N/A	0.117
Household	36.5 (24.4)	28.0 (26.9)	41.5 (26.7)	33.4 (22.1)	40.8 (27.3)	31.1 (22.9)	0.039
Other (i.e. schools)	7.8 (23.8)	4.0 (15.7)	12.5 (31.3)	5.4 (3.3)	3.5 (10.9)	28.9 (35.6)	0.084
Location not recorded	12.9 (21.7)	31.4 (24.1)	5.4 (6.5)	5.6 (5.6)	9.0 (15.8)	40.0 (38.7)	0.436
Total	100	100	100	100	100	100	
By service package							
Hygiene and environmental sanitation	30.3 (28.1)	38.6 (23.5)	35.9 (28.2)	15.4 (19.2)	22.3 (36.1)	59.6 (20.6)	0.034
Maternal and child health/family health/ service	44.7 (25.9)	35.2 (19.0)	44.2 (27.1)	62.4 (20.9)	41.1 (29.3)	17.9 (31.8)	0.005
Disease prevention and control	12.4 (11.0)	16.9 (8.9)	13.2 (13.9)	14.9 (12.5)	3.6 (6.6)	17.4 (6.6)	0.301
Noncommunicable diseases	0.6 (2.1)	1.4 (2.5)	0.1 (0)	1.2 (1.4)	0.1 (0.2)	0	0.493
Other	11.8 (22.4)	7.9 (23.6)	6.6 (6.6)	6.1 (4.9)	32.9 (39.2)	5.1 (7.6)	0.137
	100	100	100	100	100	100	
Preventive vs curative							
Preventive	75.3 (22.2)	73.6 (23.8)	79.5 (13.5)	80.6 (10.6)	61.8 (33.6)	88.3 (15.3)	<0.001
Curative	12.8 (12.0)	18.4 (14.9)	14.0 (12.2)	13.3 (7.0)	5.2 (6.6)	6.6 (0)	0.505
Unspecified[b]	11.9 (22.4)	8.0 (23.6)	6.5 (6.6)	6.1 (4.9)	32.9 (39.2)	5.1 (7.6)	0.137
Total	100	100	100	100	100	100	

[a]P-values are derived from analyses of variance, using the null hypothesis of no significant differences across regions.

[b]This category represents health education or services for which not enough detail was provided to classify as preventive or curative.

prevention and control services ($P = 0.007$) than those in urban areas. Out of the total observed time spent for providing health education and services, urban HEWs spent 47% of it for hygiene and sanitation services (Table 8).

Discussion

The year 2015 marks the end of the period earmarked for achieving the Millennium Development Goals (MDGs). Four of the eight MDGs included multiple indicators directly related to health. Ethiopia has been recognized for high achievement in relation to many of the indicators, in particular in reducing the under-five mortality rate (United Nations 2015).

This achievement has been attributed to multiple causes. One of the key contributors to the successful reduction of under-five mortality cited in the Countdown to 2015 country case study report for Ethiopia is the launching of the health extension program, involving the deployment of > 42 000 HEWs nationally (Countdown to 2015; FDRE MoH 2015).

This time and motion study of HEWs provides valuable insights into the level and pattern of HEW activity. Globally, few studies have assessed health workers' use of their time at work. This research is difficult and costly to do and often subject to measurement and sampling errors (Bratt *et al.* 1999). Our study addresses some of these weaknesses in former studies and presents valuable information about how Ethiopia's HEWs use their time.

Overall, our study found that HEWs are in position and devoting total levels of effort in line with their work obligations. HEW's mean total working days out of the total 21 consecutive days of observation was 15.5 days. Out of the total observed work time in the 21 days, the majority (24.9%) was spent in waiting for clients followed by traveling between work activities (15.5%); recordkeeping, reporting and managing family folders (13.2%); informal relationship building in the community (13.3%); providing health education and services (12.8%) and participating in meetings and giving trainings (9.3%).

Community-oriented outreach programs such as that performed by HEWs typically involve substantial time to be spent for travel and relationship building. We should not expect HEWs to spend all

Table 8. Time spent providing health education or services by service package and preventive/curative split in urban and rural settings ($N = 44$)

	All HEWs N = 44 % (SD)	Urban N = 12 % (SD)	Rural N = 32 % (SD)	P-value[a]
By service package				
Hygiene and environmental sanitation	30.3 (28.1)	46.8 (30.6)	28.0 (23.6)	0.064
Maternal and child health/family health/ service	44.7 (25.9)	38.8 (31.2)	45.6 (23.9)	0.015
Disease prevention and control	12.4 (11.0)	4.9 (13.4)	13.5 (10.7)	0.007
Noncommunicable diseases	0.6 (2.1)	1.2 (2.3)	0.5 (2.1)	0.216
Other	12 (22.4)	8.3 (22.2)	12.4 (22.9)	0.071
	100	100	100	
Preventive vs curative				
Preventive	75.3 (22.2)	88.7 (20.6)	73.3 (22.4)	<0.001
Curative	12.8 (12.0)	3.0 (12.3)	14.2 (12.1)	0.003
Unspecified[b]	11.9 (22.4)	8.3 (22.2)	12.5 (22.9)	0.071
Total	100	100	100	

[a]P-values are derived from t-tests using the null hypothesis of no significant differences between urban and rural settings.

[b]This category represents health education or services for which not enough detail was provided to classify as preventive or curative.

or even most of their time in service provision. That said, our data do suggest that a substantial amount of time is spent by HEWs in activities other than direct delivery of services, particularly in waiting for patients at the health post. This is of some concern because health posts are increasingly being seen as the locus of some key basic interventions, such as treatment of malaria, and common childhood illness like diarrhea, pneumonia, acute malnutrition and family planning services.

Why might HEWs be spending so much time waiting in the health post if patients are not present? One key hypothesis is that, while HEWs are required to staff the post to provide selected services, demand by the community for health post services may be less than anticipated. Despite efforts to educate the community about the services available at the health posts through different ways, community members may often not perceive HEWs as providing the desired clinical services.

A study conducted by Bryant and Essomba (1995) in Cameroon using a similar methodology with our study reported that 27% of observed health work time was spent on health-related activities (Bryant and Essomba 1995). Another study done in Tanzania by Manzi *et al.* (2012) reported that 56% of nurses in 24 health centres and dispensaries spent three or more unproductive hours per day. Unexplained absenteeism was accounted for the loss of an average of 51 min of work time per nurse per day (Manzi *et al.* 2012). Thus, our finding that lesser proportion of HEW time is spent in providing health education and service is consistent with the previous studies.

Our study found time allocations differed between urban and rural settings. For instance, in urban settings, of the total time spent in providing health education services, the majority of HEW time was spent on hygiene and sanitation-related activities, whereas in rural settings, the majority was spent on providing maternal and child health/family health/services. This is consistent with Ethiopia's national health policy and strategic documents that give emphasis to maternal and child health care (FDRE MOH 2015). We also found that the HEWs spent just less than half (42.8%) of the total observed time at health post level and the remaining time was spent at household and outreach levels. This split between the health post and home visits and outreach is largely consistent with the recommendations in the Ministry of Health HEP guidelines (HEEC FMoH 2007; Workie and Ramana 2013; FDRE MoH 2015). This is

comparable with a study conducted in Ethiopia that reported HEWs spending 37% of their productive time in a week in the community (Mangham-Jefferies *et al.* 2014). The study done in Cameroon by Bryant and Essomba (1995) presented a very small percentage of time spent on preventive and health promotion activities (<1%), indicating the minimal involvement of lower level health cadres in preventive care (Bryant and Essomba 1995).

The primary focus of the HEP is disease prevention and health promotion through behavior change communication. Consistent with this focus, our study found that, both in rural and urban areas, out of the total time spent in providing health education and services, the majority was spent for the provision of prevention and health promotion services.

Our study also found that HEWs in urban areas worked significantly less than those in rural areas. For example, HEWs in Addis Ababa worked on average 4 days less than HEWs in Tigray region during the same 21 days of observation. HEWs in Addis Ababa spent only 3.6% of the total observed time for providing health education and services. In the past 3 years, the Ethiopian government has been designing new models for urban primary healthcare service delivery that may address this challenge.

There were also differences in observed work effort among regions. It is not clear at this time what could explain these regional differences. More in-depth comparative analysis and regular forums to facilitate exchange of lessons and best practices across regions is recommended.

Our findings should be interpreted in light of some limitations. Although the sample of HEWs was diverse and data were attained through direct observation, the findings derive from a relatively modest number of sites and HEWs (from 44 HEWs out of > 38 000 HEWs and 21 days of observation from 365 days in a year) and results may differ in other areas of Ethiopia and possibly in a different season of the year. Moreover, we had limited statistical power to detect significant difference in time allocations among PHCUs. Additionally, it is possible that HEWs who were being observed behaved differently; Hawthorne effect may have some effect with regard to bias. Analysis was done to assess the existence of such bias by comparing the result from the first 3 days of observation with the result from the rest of observation days and no significant difference was observed, indicating the bias to be minimal.

Conclusion and recommendations

Ethiopia's HEWs are generally seen to have made an important contribution to Ethiopia's rapid health progress in rural areas. HEWs have been posted in almost every rural kebele. They have been trained to support an important program of health promotion and disease prevention. The scope of services they provide and support has been expanding with an increasing range of basic clinical tasks. The Federal Ministry of Health (FMOH) is committed to sustaining and improving the HEWs role in Ethiopia's primary health care system.

While this study shows that HEWs are present and active, it reports a relatively low percent of their time is spent in direct health education and service provision, and a relatively high share of their time is spent waiting for patients and clients in health posts and in travel between work activities. We recommend all concerned authorities to focus on implementing strategies that will enhance HEWs productivity by reducing the amount of time they spend in the health posts, as they may be waiting idly. Additional strategies to strengthen relationships with the community and enhance demand creation efforts would be helpful. Last, it is critical to ensure that the HEW capacity matches what community members desire in terms of their skills and training to meet the needs of the populations they serve.

The findings of this study raise some concerns about the future role and effectiveness of the HEWs in Ethiopia's health system. We recommend that Ethiopia's FMOH pay close attention to the evolving position of the HEW to assure productivity and quality of care as Ethiopia invests in the development of primary care. Under the new 5-year health plan, the HSTP, Ethiopia is continuing to expand the scope of services delivered by health centres and health posts, and investing in new primary hospitals. Other important factors in the HEWs' environment are also evolving, such as transportation improvements and education opportunities. To continue to be successful, the HEW's competencies and work must evolve with these changes.

Ethiopia has achieved much with its focus on primary health care and the health service to community connection. HEWs are the face of that commitment, and their contribution is still much needed. The FMOH can benefit from deepening its use of existing data to analyze the significant variation in output observed across districts both within and between regions and its causes. Such data could provide a platform for assessing more precisely in what ways and how much HEWs contribute to improving health outcomes and equity in both rural and urban areas. How will the HEW role evolve in terms of time spent in providing health promotion and disease prevention in the community relative to time spent in more clinical services? How will HEW service delivery relate to improvements in clinical services at higher-level facilities? There may be different answers to these questions in urban and rural areas and in different types of settings in rural areas. Deeper exploration of these issues may help regions and districts to develop innovative strategies to improve the productivity and quality of services provided by HEW within the primary healthcare system.

Ethical approval

The study proposal was reviewed and approved by the Human Subject Committee of Yale University. The Ethiopian Ministry of Health reviewed the research and provided support letter. Information about the study was provided to study participants and consent was obtained from them before their voluntary participation.

Notes

1. In this report, we use the acronym HEW to refer to both health extension workers in rural settings and HEPs in urban settings.
2. Woreda is a district run by cabinet with average of 100 000 populations.

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